

10/601217

Docket: 643-004US

transistor, and wherein said second output terminal of said voltage-controlled oscillator is electrically connected to said gate terminal of said fourth NMOS transistor.

15. The apparatus of claim 14 further comprising:

a first input terminal wherein said first input terminal is electrically connected to said gate terminal of said first NMOS transistor;

a second input terminal wherein said second input terminal is electrically connected to said gate terminal of said third NMOS transistor;

a bias input terminal wherein said bias input terminal is electrically connected to said gate terminal of said fifth NMOS transistor.

16. The apparatus of claim 14 further comprising a DC power supply having a positive terminal and a negative terminal, wherein said positive terminal of said power supply is electrically connected to said second terminal of said first resistor, and wherein said negative terminal of said power supply is electrically connected to said source terminal of said fifth NMOS transistor.

17. An method comprising:

comparing a first voltage to a second voltage, wherein comparing said first voltage to said second voltage produces a third voltage that is the difference between said first voltage and said second voltage;

obtaining the peak-to-peak voltage of said third voltage; and

filtering said peak-to-peak voltage wherein a DC voltage is obtained that is based on the phase difference between said first voltage and said second voltage.

18. The method of claim 17 further comprising producing an AC voltage whose frequency is proportional to said DC voltage.

19. The method of claim 18 wherein said first voltage, said second voltage, said third voltage, said peak-to-peak voltage, and said DC voltage are selected from the group consisting of differential and single-ended.

20. An method comprising:

comparing a first current to a second current, wherein comparing said first current to said second current produces a third current that is the difference between said first current and said second current;

obtaining the peak-to-peak current of said third current; and